

Association for Information Systems AIS Electronic Library (AISeL)

AMCIS 2007 Proceedings

Americas Conference on Information Systems
(AMCIS)

December 2007

Understanding Organizational Transformation from IT Implementations: A Look at Structuration Theory

Linying Dong

Thilini Ariyachandra
University of Cincinnati

Follow this and additional works at: <http://aisel.aisnet.org/amcis2007>

Recommended Citation

Dong, Linying and Ariyachandra, Thilini, "Understanding Organizational Transformation from IT Implementations: A Look at Structuration Theory" (2007). *AMCIS 2007 Proceedings*. 236.
<http://aisel.aisnet.org/amcis2007/236>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2007 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

UNDERSTANDING ORGANIZATIONAL TRANSFORMATION FROM IT IMPLEMENTATIONS: A LOOK AT STRUCTURATION THEORY

Dong, L. School of Information Technology Management, Ryerson University

E-mail: ldong@ryerson.ca

Ariyachandra, T. Information Systems Department, College of Business, University of Cincinnati

E-mail: ariyact@uc.edu

Abstract

Past evidence suggests that organizational transformation from IT implementations is rare. Data warehousing promises to be one advanced information technology that could produce transformation. Based on the stages of growth theory and adaptive structuration theory (AST), this paper attempts to understand how data warehousing could lead to organizational transformation by studying a data warehouse's growth in an organization. In particular, the benchmark variables for data warehousing stages of growth are examined using adaptive structuration theory to explain organizational transformation that takes account into unique organizational situations.

Keywords

Data warehousing, Stages of Growth, Adaptive Structuration, Transformation

Introduction

From its beginnings, MIS has made promises of revolutionary organizational transformation through the use of information technology. Leavitt and Whisler (1958) were among the first MIS scholars to predict that computers would have dramatic impacts on organizations. These promises and predictions motivated management in many organizations to implement IT innovations with the hopes of dramatically affecting organizational performance. Researchers have discovered the evidence of organizational transformation in streamlined organizational business processes, increased decision making, enhanced user skills, improved competitive advantage, and ultimately faster organizational growth (Davenport 2000a; Davenport 2000b; Waston et al. 2002).

The potential benefits reaped through IS implementations usually occur over a sustained time period. Most past IT implementations have been perceived as one time product implementations producing or enhancing a given business process. In contrast, data warehousing is an advanced information technology perceived more as an IT infrastructure project that has the potential to trigger changes in organizational business processes as it interacts with other sources of organizational structure (DeSantics et al. 1994). It is perceived more as "a journey, not a destination."

Despite the general impact of advanced information technologies on organizations, empirical cases demonstrate that different organizations have exhibited different patterns of transformations (Waston et al. 2002). Some have seen improved user skills and increased efficiency, others have seen the revitalization of organizational business processes, and some others have experienced the transformation of organizational culture (e.g., Cooper et al. 2000; Waston et al. 2002). The diversity puzzles practitioners who want to identify and understand organizational transformation due to the introduction of a new information technology, and also challenges researchers as to how to discern distinct transformation patterns for each single organization.

The potential of an IT to evolve and transform business processes in organizations makes it an interesting phenomenon to study. Kotter proposed a prescriptive model for organizational transformation (1995). Recent research has documented the various patterns exhibited by this phenomenon (Cooper et al. 2000; Goodhue et al. 1999; Hayley et al. 1999; Watson et al. 2001). The results of these research efforts present vital information about the complexity, the issues and steps leading to a successful technology adoption and consequent organizational transformation. What is missing is the examination of patterns of organizational transformation through the process of IT implementations.

The purpose of this paper is to demonstrate how examining benchmark variables in stages of growth using adaptive structuration theory can be applied to gain an indepth understanding of organizational transformation that takes into account unique organizational situations. In particular, , we intend to answer the following research question “How organizational transformation takes place within the context of data warehouse adoption.” By combining aspects of the stages of growth theory with AST, we are able to provide useful insights into transformation patterns that are unique to a single organization.

The paper is structured as follows. We first review the extant literature on IS implementations and innovation adoption. We then present the adaptive structure theory (AST), and apply the theory to capture the intricacies of change in data warehousing at a detailed level and to provide reasoning why many warehouse implementations show varying patterns of organizational transformation.

Theoretical Background

Research on information systems implementation

An IS implementation is a complicated process involving the interaction among technology, people, and business processes (Kwon et al. 1987; Leonard-Barton 1988; Lucas et al. 1990; Purvis et al. 2001). Decades of research on information systems implementations have generated an enriched understanding of IS implementations and a wealth of knowledge on success factors for IS implementations.

Information systems implementation is defined as a process whereby target users adapt and accept the innovation, and routinize the technology innovation into their normal working procedures (Kwon et al. 1987). It is an organized change associated with a new system (Lucas 1981). Leonard-Barton (1988) views the change process as a dynamic process of mutual adaptation between an information technology and its environment. The adaptation cycle can be large or small, depending on the magnitude of the misalignments, and may be either beneficial or detrimental. Recent empirical studies have confirmed the mutual adaptation process (Boersma et al. 2005; Soh et al. 2004).

Diverse factors affect the success of IS implementations, including individual factors (e.g., education, job tenure, experience, and role involvement) (e.g., Alavi et al. 1992; Griffith et al. 1996)}, structural factors (e.g., specialization, centralization, and formalization) (e.g., Alavi et al. 1992; Sultan et al. 2000), organizational factors (e.g., size, management support) (e.g., Grover et al. 1993; Sharma et al. 2003), task-related factors (e.g., task uncertainty, autonomy, and responsibility) (e.g., Chengalur-Smith et al. 2000; Sultan et al. 2000), and environmental factors (e.g., heterogeneity, uncertainty, and competition) (e.g., Alavi et al. 1992; Grover et al. 1993).

These studies have revealed the complexity of IS implementations, and provided rich information regarding the implementation processes and factors critical to achieving IS implementation success. However, the extant literature has yet explored how these different factors combined to affect the mutual adaptation process and ultimately organizational transformation.

Research on Innovation Adoption

Organization innovation studies have focused on types of innovations, characteristics of innovations, factors that determine the rate, pattern, and extent of the spread of an innovation among organizations over time (Brancheau et al. 1990; Fichman 2000). The dual-core theory distinguishes two types of innovations— technical and administrative innovations (Daft 1978). A recent study of Swanson extends the dual-core theory by adding IS innovations to the model (Swanson 1994). Depending on the extent of changes in products, services, and production process, innovation studies categorize innovations into radical (those that evoke fundamental changes) and incremental (those that produce a lesser change) (Damanpour et al. 1998; Nord et al. 1987). Aside from organizational structures that facilitate innovation implementation (Duncan 1976), other factors that determine innovation adoption and diffusion include environmental characteristics (e.g., industrial and environmental dynamism), characteristics of innovation (e.g., relative advantage, compatibility, and complexity), organizational characteristics (e.g., organizational structure, financial readiness, and technological readiness), and innovation propagation characteristics (e.g., promotion, pricing, and advertising) (Damanpour 1991; Fichman 2000; Wilson, et al. 1999).

Another theme of innovation studies is the examination of the process through which an innovation is adopted. The most noted is the three-stage model, in which the organizational adoption of an innovation is categorized into three stages: initiation, adoption, and implementation (Pierce et al. 1977; Rogers et al. 1971). The initiation stage involves scanning of organizational problems and opportunities as well as IT solutions. Adoption is a rational and political decision to get organizational backing for implementation of the IT application. Implementation includes development and installation activities designed to ensure that the expected benefits of the innovations are realized. There are other stage models including Nolan's stage model, the evolution of information centers (Magal et al. 1988), integration of business and information systems planning (King et al. 1997), skill requirement changes of systems analysts (Benbasast et al. 1980), and end user computing management (Henderson et al. 1986) are some of them.

A recent study has defined three stages of growth that follows a "S" curve mark (i.e., initiation, growth, and maturity) (Watson et al. 2001). In the Initiation stage, data warehouse applications are initiated; in the growth state, the applications are diffused within the organization, and in the maturity stage, the applications become fully integrated into the company's operations. Each stage is uniquely identified by a set of characteristics (i.e., benchmarks) (Figure 1), the values of which indicate the most likely theoretical characteristics applicable to each stage of growth (King et al. 1997). , Appendix A presents the three stages and the benchmark variables that help identify each stage of data warehousing.

The matrix of benchmark variable values for data warehousing, as they change through the stages, provides a simple guide to understanding a complex phenomenon. For instance, "the impact on user skills and jobs" benchmark variable's evolution through the stages can be described briefly as follows. In the initiation phase, early adopters see a change in the technical skills that they need to perform their jobs. Next, in the growth stage, the early adopters are given lead positions within departments to act as technology diffusion agents. In addition, employee turnover occurs as employees who cannot adjust to the new job and skill requirements leave and the organization acquires technology savvy individuals. Finally, in the maturity stage, the overall organization assimilates the technology. Employees become more specialized in their roles and early adopters become key departmental resources for others in their business unit. To the manager attempting to understand the effects of data warehouse technology assimilation on the roles and skills of employees, the above information provides, in Nolan's words, "a framework useful for identifying issues and evaluating and controlling the growth of " data warehouses (Gibson et al. 1974).

While intuitively appealing, empirical studies have discovered that actual growth patterns can be inconsistent from the established patterns of growth for a given stage (Benbasat et al, 1984; King et al. 1997). For instance, in stages of growth in data warehousing, not all data warehouse strategy implementations display the benchmark matrix values that define the Maturity stage (Watson et al. 2001). Additionally, in some cases, there was evidence of what appeared to be overlapping and/or switching of benchmark values through the stages.

Accordingly, research on innovation adoption enriches our understanding of different types of innovations, facilitators and inhibitors of innovation adoptions, and stages that organizations grow through the innovation adoption. However, the literature has yet answered why different organizations exhibit different transformation patterns, even through a same information system is adopted. While benchmarks in each stage of growth provide a generalized, broad framework useful for identifying issues and evaluating and controlling the growth of a data warehouse, it does not present an explanation for warehousing efforts that deviate from the benchmark values for each stage. Therefore, to gain a deeper understanding of organizational transformation process evoked by a new information system needs evaluation through the combination of the stages of growth theory and another lens. Adaptive structuration theory provides an appropriate lens to examine the changes in characteristics (i.e., benchmarks variables) at each stage of data warehousing growth.

Adaptive Structuration Theory

Orlikowski (1992) was the first to apply the duality of structure concept to IT and propose the concept of duality of IT in organizations. She proposed that IT in organizations have dual states: technology is created and changed by human action and it is also used by humans to accomplish action. The adaptive structuration theory (AST) presented by Desanctis and Poole (1994), extends the work of Orlikowski (1992) further and provides an approach to studying the role of advanced technologies in organizational change by considering the mutual influence of technology and social processes. More specifically, it presents precisely how technology structures can trigger organizational change and vice versa through the analysis of the *complexity* of the technology-action relationship (i.e., analysis of the “cans of worms” as Gibson and Nolan (Gibson et al. 1974) stated).

The IT structuration as described by AST can help analyze the process of structuration as described from its first appropriation to subsequent actions. It offers a means of looking at different combinations of AST construct values in order to predict the dynamic nature of organizational structure. In Giddens words describing structuration in general,

offers a conceptual scheme that allows one to understand how actors are at the same time the creators of social systems yet created by them...It is an attempt to provide the conceptual means of analyzing the often *delicate interlacings* of reflexively organized action and institutional constraint (Giddens, 1991, p. 204).

The highlighted phrase emphasizes the central contribution of structuration theory. By enabling one to analyze and understand the ‘delicate interlacings of...organized action’ the theory provides a platform for understanding how organizational evolution and growth takes place. Thus, structuration, specifically adaptive structuration theory, provides an excellent lens to observe the evolution of information systems innovations within the organization.

In particular, each integral part of the AST model that leads to the recursive process of interaction can be applied to data warehousing implementations. AST can help explain the causation and reasoning behind almost all the benchmark variable values stated in the Data warehousing benchmark variable matrix (Appendix A).

According to the AST model, the structure of an information system, the other sources of structure, such as task and organizational environment and the employee group’s internal makeup all affect human interaction with the data warehouse. The manner in which these constructs affect human appropriations with the data warehouse affect outcomes as well as reaffirms and/or changes existing structure. As some existing structures get reaffirmed and other structures emerge through structuration, benchmark variable values (e.g., user skills, routinization) change and provide the reasoning behind the changes in values.

The adaptive structuration theory provides an appropriate lens to understand the finer details of organizational evolution. It can assist in the explanation of the changes in the benchmark variable values through the stages of growth. Anthony Giddens (1984; 1993) work on structuration provides a process-oriented theory that treats organizational structure as both a product of and a constraint on human action. It is a metatheory whose primary goal is to connect human action with structural explanations in social analysis (Riley 1983). To do so, Giddens (1993) introduces the duality of structure that describes the reciprocal relationship between human actors and structure. Thus, structuration can be simply described as the production and reproduction of social systems through the application of generative rules and resources.

Principles of structuration have been applied at the organizational level (Pettigrow 1987; Ranson et al. 1980), at the industry level (Huff et al. 1994) and as an explanation to organizational culture (Riley 1983). Structuration theory provides insights into technology transfer as well (Barley 1986; DeSantics et al. 1994; Orlikowski et al. 1991).

Before application of AST to attempt to explain benchmark variable data, key facts with regard to structuration theory should be noted. As Giddens stated (1993), structuration is bound by time and space. For example, the varying historical settings within different organizations can lead to the creation of different organizational outcomes from identical technology implementations. Thus, adaptations of AST to the benchmark variable values will vary according to organizational context. As a result, it may not accurately reflect the appropriations process in every organization. However, it does give both researchers and industry alike the opportunity to recognize what aspects of organizational structure and human behavior affect the structuration process. Consequently it provides them an opportunity to predict outcome structures (DeSantics et al. 1994).

In the following, we are going to apply AST to organizational growth and transformation under the context of data warehousing implementation. Data warehousing is an advanced information technology perceived more as an IT infrastructure project that has the potential to ‘trigger changes in organizational business processes as it interacts with other sources of

organizational structure' (DeSantics et al. 1994). As such, data warehousing adoption and growth provides a great vehicle to investigate organizational transformation.

Application of the Stages of Growth Theory and AST to Data Warehousing

First a specific hypothetical data warehousing situation is given. Capital X is a financial institution, composed of a set of independent units offering different financial products to customers. Each department has established its own conventions on customer interactions, interdepartmental interactions, and legacy system usage. For instance, marketing analysts of different functional units have their own conventions of gathering data from the legacy systems and manually analyzing them.

To increase market share in the financial services industry, upper management issued a directive to build an enterprise wide data warehouse to support an overall customer focus strategy. The project is sponsored by the CIO who hired consultants to construct the enterprise wide data warehouse.

The actual data warehouse implementation took place in two major phases. The first major phase involved accumulating data from business units, converting the data, and creating the data warehouse. At the conclusion of phase one, the warehouse gave limited functionality to its users to carry out basic marketing analysis tasks. In the second phase, the organization instituted the fully functional enterprise wide data warehouse as a means of collecting, searching, and analyzing information about customers to support the new organizational strategy and diffused it to the entire organization.

The above description of Capital X can be applied to AST to explain data warehousing benchmark variable value changes through stages. Specifically, it can explain some of the possible underpinnings in the impact on user roles and skills benchmark variable previously studied through the lens of stages of growth theory. In the context of Capital X, AST is used to explain the data warehouse's impact on marketing analysts' roles and skills over time and the reasoning behind the impacts (Figure 2).

During Capital X's first phase, a set of 30 staff members were chosen from various functional units based on their good PC and mainframe skills to be trained as the first adopters of the data warehouse. Despite their different functional unit origins, their technical aptitude and desire to learn a new application characterized the general mindset of this group of early adopters (Figure 2, a-1). They went through the training process with a sense of eagerness; their technical knowledge had them attuned to the faults of the legacy systems and lack of integration. Knowing the intent of upper management, the availability of the consultants and proper training programs, the early adopters began utilizing the system to identify customer segments (Figure 2, a-2). The ease and simplification provided by the warehouse application evidenced by initial output and task efficiency led to continued faithful appropriations of the warehouse (Figure 2, a-3). The early adopters social interactions with the data warehouse resulted in the development of more effective customer retention strategies and other decision outcomes (Figure 2, a-4). Consequently, early adopters began to form an integrated view of the organization and a more structured approach to tasks (Figure 2, a-5). Due to their integral role as early adopters, these marketing analysts first became diffusion agents and gradually key departmental resources for data warehousing applications.

In the second phase, Capital X began diffusing the technology to the remaining marketing analysts within the organization. Although the spirit of the warehouse was further solidified to the late adopters by the actions of the early adopters, their general behavior towards the new technology was resistance (Figure 2, b-1). Their technical knowledge and skills were limited. The late adopters had traditionally used the legacy systems for data collection and conducted manual analysis of data (Figure 2, b-2). The senior analysts took leadership in leading the rest of the late adopters to unfaithful appropriations of the data warehouse. As the late adopters were unaware of the inefficiencies of the previous system and task process, they continued to try to find familiar data elements from the data warehouse to conduct manual analysis (Figure 2, b-3). Upper management had not implemented a monitor and control system to supervise appropriations. Furthermore, as the previous organizational structure provided more autonomy and did not require the structure dictated by the new roles, the late adopters saw no need to change their skills or behavior. As a result, the analysis and outcomes from the late adopter group lacked quality and did not provide Capital X with information that promoted their customer focus strategy (Figure 2, b-4). Furthermore, their unfaithful appropriations led to insubordinate behavior and task completion (Figure 2, b-5). Despite early adopter and management efforts to convert late adopters to use the warehouse faithfully, such structuration was not successful. Consequently, resisters (i.e., senior traditional marketing analysts) were fired, to hire employees with the right analytical skills to utilize the data warehouse applications to its maximum potential. Benchmark variable matrix for the stage of growth for Capital X is listed in Table 1.

As shown in table 1, some of these benchmark variables are not unique across the initiation and growth stage. Additionally, despite the fact that the data warehouse is fully integrated into Capital X, benchmark variables do not display values defining that the company is in the maturity stage. However, with the structuration perspective, the benchmark variables reveal the duality of structure at play. Initially, the warehouse changed the behavior and structure of task performance of the early adopter and late adopter. Consequently, through knowledge acquisition and power gained through expertise, the early adopter began to change the existing organizational structure taking on the role of training other users and becoming an indispensable resource for his/her business unit. The late adopter that did not faithfully appropriate began to negatively affect the quality of output produced, and tried to establish a deviant behavior structure. As a consequence, the late adopter was replaced preventing the creation of a deviant social structure.

The case of Capital X and the behavior of its marketing analysts present one possible interpretation for the benchmark variable values over time. They also indicate how the interplay of different constructs in the AST model at any given time could change the structural outcomes and the values of the benchmark variables.

Discussions and Conclusion

The study is a first step in the process of attempting to understand the data warehouse's capacity to transform an organization when aligned with strategy. However, this study is limited in that we apply only a hypothetical example to illustrate the merit of our perspective. In order to get an accurate understanding of the appropriations process in interactions and the structures that emerge, an intensive ethnographic type study of the organizational data warehousing growth would be necessary.

The primary contribution of this paper is that we combine the stages of growth theory and AST to explain how benchmark variables for data warehousing stages of growth change over time. This is a first step in the process of studying organizational transformation as it takes place when aligned with an advanced IT technology such as data warehousing. In particular, we demonstrate, through a case analysis, the growth and transformation that takes place due to a data warehouse implementation. It goes beyond giving a list of features presented by the benchmark variable matrix. Thus, structuration provides a deeper understanding of why some values exist for a benchmark variable in one given stage. Furthermore, it confirms Nolan's words that transformation and changes in an organization takes place in the form of a fluid process (Gibson et al. 1974). This fluid process is explained through the ever-changing nature of structure in structuration theory. Structuration theory explains the process of evolution (i.e., stages of growth) at a global level with arbitrary break points which practitioner could call stages. Structuration enables industrialists and academicians alike to understand what occurs as the data warehouse grows and how the stages will progress.

The paper also brings another reality to light. Depending on their inputs to the system – technology structure, other sources of technology, and group internal system – the appropriations that take place and the decision outcomes that result will change. Simultaneously, organizational structure will also change. Thus, AST identifies three key aspects of organizations, which may dictate how organizational transformation may occur that organizations should pay attention to. For instance, the fact that one of those aspects is group internal systems, (i.e., human actors and human behavior) speaks volumes of the predictability of AST or structuration. It indicates that as long as human beings play a role in organizations, organizational transformation can never be accurately predicted. However, what this theory provides is a means of identifying telltale signs stating the direction structure is changing and progressing.

Further explanation of concepts revealed in this paper requires study of organizational growth and change in an industry setting. Desanctis and Poole (1994) presents a method of studying organizational transformation through different levels of analysis –micro, global and institutional. . Data need to be gathered from all sources of social structures including users, warehouse staff, top managers, consultants, and customers. Qualitative data analysis techniques can be applied {(Eisenhardt 1989, Miles and Huberman 1994, Orlikowski 1996). Further study along this line of research may lead to the discovery of different types of appropriations and emerging structures that would enable both industry and academe to deal with and understand uncertainty in organizations and more effectively pursue business goals.

Figure 1. Stages of Growth Model

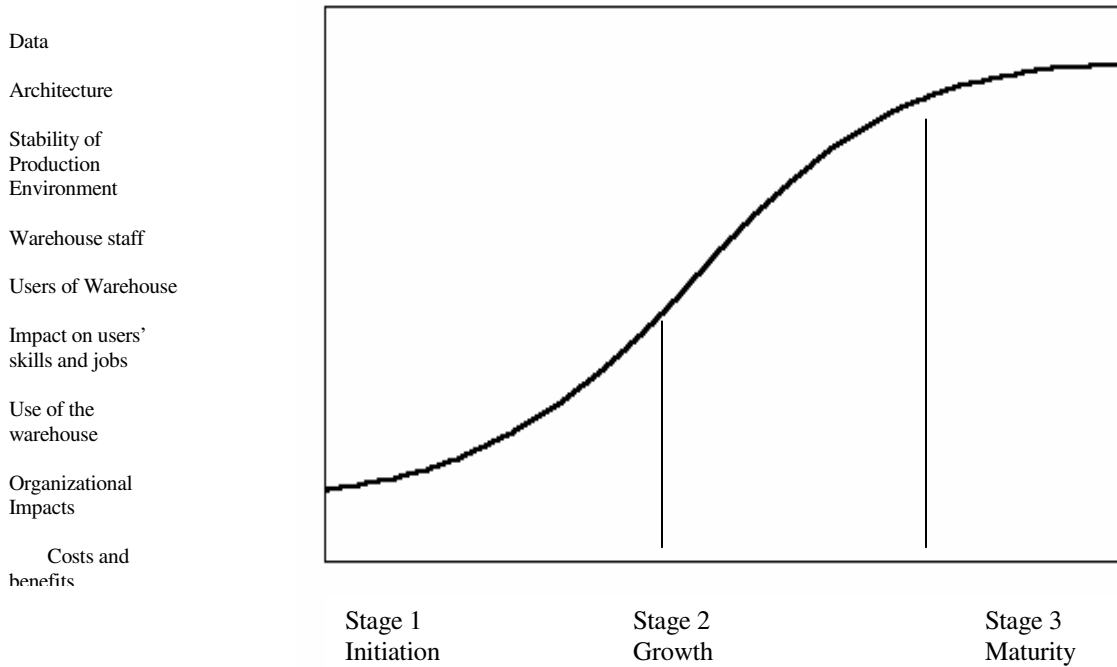


Table 1 Benchmark Variable Matrix for the Stage of Growth for Capital X

Benchmark variables	Initiation stage	Growth stage
Data	fragmented data for entire organization	Integrated data across organizational departments
Architecture	Multiple data marts	Multiple data marts
Stability of product environment	Procedures are inconsistent across departments	Standard procedures are not well established
Warehouse staff	In-house personnel are inexperienced	In-house personnel are inexperienced and resistant to the data warehouse
Users	Users do not access the warehouse	Users have access to the warehouse
Impact on users' skills and jobs	Users need to update their knowledge and skills	Users need to realize the benefits of the warehouse
Applications	Identify customer segments	ad hoc access
Costs and Benefits	Task efficiency	The analysis and outcomes lack quality and do not provide the company with the information that promote its customer focused strategy
Organizational impact	Contribute to the development of more effective customer retention strategies and other decision outcomes	Resistors are fired, and people with the right analytical skills need to be hired

DATA WAREHOUSE STRUCTURE

Structure: Integrated data. Meta data based on overall organization's business rules. Data model reflects entire organization. Structured applications for data manipulation.

Spirit: Upper management mindset: Data warehouse will be "Customer focus strategy implementation vehicle."

Outside Consultant motivation: Client requirements satisfaction.

Designer goals: User-friendly interfaces, training, detailed manual instructions and structured, efficient applications and atmosphere for data analysis. Inter-functional unit cooperation leading to high returns from integrated view of customers.

OTHER SOURCES OF STRUCTURE

Task: Customer identification, retention and market segment analysis. All analysts' tasks geared to primary task of identifying customers. Previous task structure - manual data analysis based on data collected from legacy systems.

Organization Environment: State of flux. Upper management pressure to implement and diffuse data warehousing technology in organization to support customer focus strategy. Changes to previous organizational structure and culture. Previously, independent functional units specialized in a unique set of products and served customers. New structure requires knowledge of all products in organization and integrated view of customers.

GROUPS INTERNAL SYSTEM

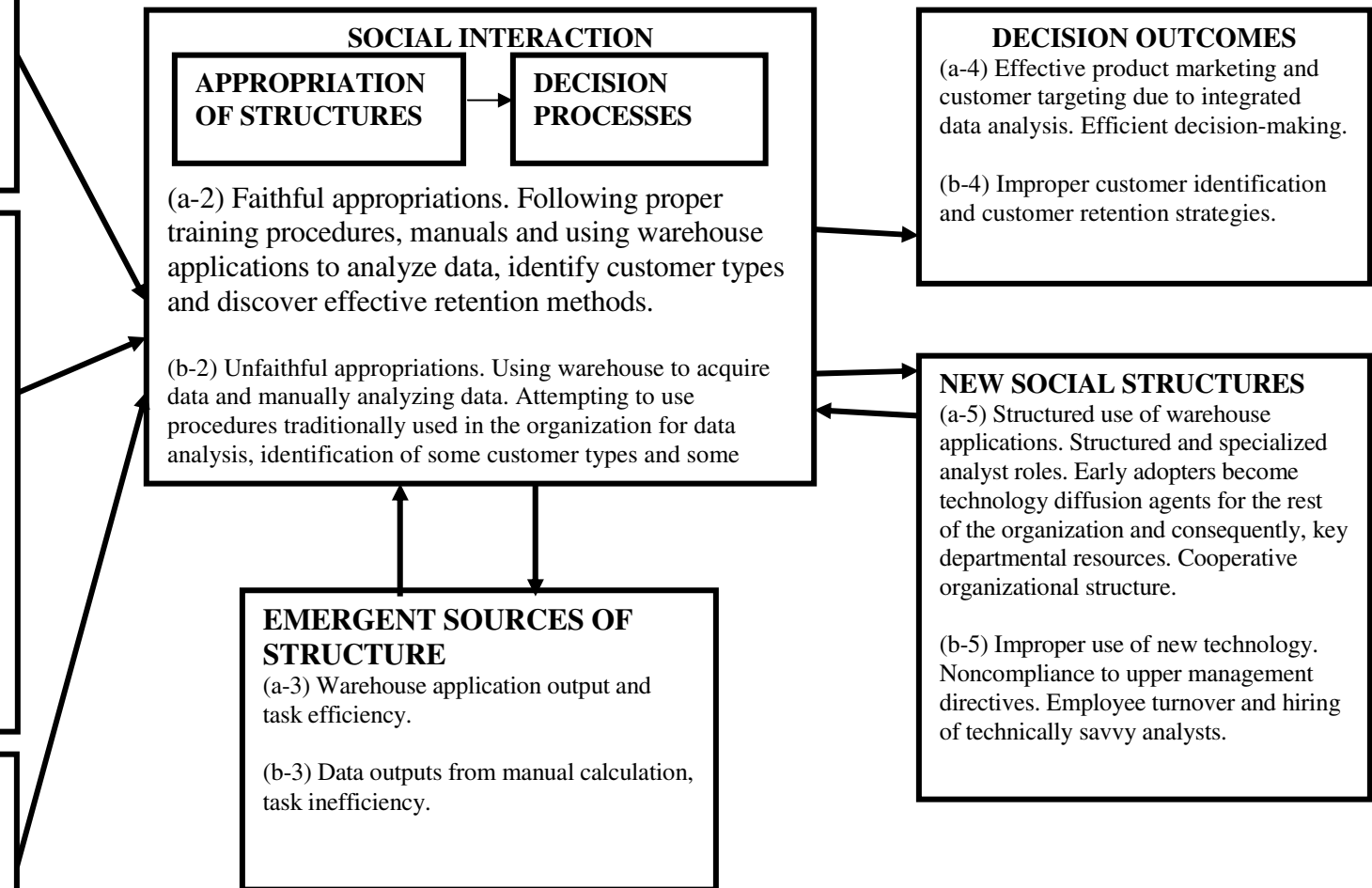
(a-1) *Early Adopters:* Individuals chosen for their technical background and aptitude to learn. General understanding and consensus on shortcomings of legacy systems and benefits of data warehouse.

(b-1) *Late Adopters:* Remaining analysts, whose primary tasks were data collection and manual analysis. General lack of PC skills. Wide-ranging resistance to change in IT, to acquiring new skills and to surrendering autonomy of functional units. Senior analysts' authority.

Figure 2. Application of AST to Capital X Marketing Analysts

(a) = *Early adopter activity and outcomes*

(b) = *Late adopter activity and outcomes*



References

- Alavi, M., and Joachimsthaler, E.A. "Revisiting DSS Implementation Research: A Meta-Analysis of the literature and Suggestions for Researchers," *MIS Quarterly* (16:1), 1992, pp 95-116.
- Barley, S.R. "Technology as An Occasion for Structuring: Evidence from Observations of CT Scanners and the Social Order of Radiology Departments," *Administrative Science Quarterly* (31:1), 1986, pp 78-108.
- Benbasast, I., Dexter, A.S., and Mantha, R.W. "Impact of Organizational Maturity on Information Systems Skills," *Communications of the ACM* (27:5), 1980, pp 476-485.
- Boersma, K., and Kingma, S. "From Means to Ends: The Transformation of ERP in a Manufacturing Company," *Journal of Strategic Information Systems* (24:2), 2005, pp 197-219.
- Brancheau, J.C., and Wetherbe, J.C. "The Adoption of Spreadsheet Software: Testing Innovation Diffusion Theory in the Context of End-user Computing," *Information Systems Research* (1:2), 1990, pp 115-143.
- Chengalur-Smith, I., and Duchessi, P. "Client-server Implementation: Some Management Pointers," *IEEE Transaction on Engineering Management* (47:1), 2000, pp 127-145.
- Cooper, B.L., Watson, H.J., Wixom, B., and Goodhue, D.L. "Data Warehousing Supports Corporate Strategy at First American Corporation," *MIS Quarterly* (24:4), 2000, pp 547-568.
- Daft, R.L. "A Dual-core Model of Organizational Innovation," *Academy of Management Journal* (21:2), 1978, pp 193-210.
- Damanpour, F., and Gopalakrishnan, S. "Theories of Organizational Structure and Innovation Adoption: The Role of Environmental Change," *Journal of Engineering and Technology Management* (15:1), 1998, pp 1-24.
- Davenport, T.H. "The Future of Enterprise System-enabled Organizations," *Information Systems Frontiers* (2:2), 2000a, pp 163-180.
- Davenport, T.H. *Mission Critical: Realizing The Promise of Enterprise Systems* Harvard Business School Press, Boston, Massachusetts, 2000b.
- DeSantics, G., and Poole, M.S. "Capturing the Complexity in Advanced Technology: Adaptive Structuration Model," *Organization Science* (5:2), 1994, pp 121-147.
- Duncan, R.B. "The Ambidextrous Organizations: Designing Dual Structures for Innovation," in: *The Management of Organization: Strategy and Implementation*, R.H. Kilmann, L.R. Pondy and D.P. Slevin (eds.), North-Holland, New York, 1976, pp. 167-188.
- Eisenhardt, K. M. (1989) Building Theories from Case Study Research. *Academy of Management Review*, 14, 532-550.
- Fichman, R.G. "The Diffusion and Assimilation of Information Technology Innovations," in: *Framing The Domains of IT Management: Projecting the Future. Through The Past*, R.W. Zmud and M.F. Price (eds.), Pinnaflex Educational Resources, Inc., Cincinnati, Ohio, 2000, pp. 105-127.
- Gibson, C.F., and Nolan, R.L. "Managing the Four Stages of EDP Growth," *Harvard Business Review* (40:1), 1974, pp 76-88.

- Giddens, A. *The Constitution of Society: Outline of the Theory of Structure* University of California Press, Berkeley, CA, 1984.
- Giddens, A. *Problems of Action and Structure* Stanford University Press, 1993.
- Goodhue, D.L., Wixom, B., and Waston, H.J. "Data Warehousing and Organizational Change at the IRS: Increasing Compliance Without Taxpayer Audits," in: *Annals of Cases on Information Technology Applications and Management in Organizations*, Idea Group Publishing, Hershey, Pennsylvania, 1999.
- Griffith, T.L., and Northcraft, G.B. "Cognitive Elements in the Implementation of New Technology: Can Less Information Provide More Benefits?" *MIS Quarterly* (20:1), 1996, pp 99-110.
- Grover, V., and Goslar, M.D. "The Initiation, Adoption, and Implementation of Telecommunications Technologies in U.S. Organizations," *Journal of Management Information Systems* (10:1), 1993, pp 141-163.
- Hayley, B.J., Watson, H.J., and Goodhue, D.L. "The Benefits of Data Warehousing at Whirlpool," in: *Annals of Cases on Information Technology Applications and Management in Organizations*, Idea Group Publishing, Hershey, Pennsylvania, 1999.
- Henderson, J.C., and Treacy, M.E. "Managing End User Computing for Competitive Advantage," *Sloan Management Review* (50:4), 1986, pp 37-46.
- Huff, A., Stimpert, L., and Huff, J. "Entrepreneurial Activity and Industry Structuring," *Organization Science* (3:3), 1994, pp 398-427.
- Kazanjian, R.K. "Relation of Dominant Problems to Stages of Growth in Technology based Ventures," *Academy of Management Science* (31:2), 1988, pp 257-279.
- King, J.L., and Teo, T.S.H. "Integration between Business Planning and Information Systems Planning: Validating Stage Hypothesis," *Decision Sciences* (28:2), 1997, pp 279-309.
- Kotter, J.P. "Leading Changes: Why Transformation Efforts Fail," *Harvard Business Review* (73:2), 1995, pp 59-67.
- Kwon, T.H., and Zmud, R.W. "Unifying the Fragmented Models of Information Systems Implementation," in: *Critical Issues in Information Systems Research*, John Wiley and Sons Ltd., New York, 1987, pp. 227-252.
- Leavitt, H.J., and Whisler, T.L. "Management in the 1980's," *Harvard Business Review* (36:6), 1958, pp 41-48.
- Leonard-Barton, D. "Implementing as Mutual Adaptation of Technology and Organization," *Research Policy* (17:5), 1988, pp 251-267.
- Lucas, H.C. *Implementation: The Key to Successful Information Systems* Columbia University Press, New York, 1981, pp. x, 208 ill. 224 cm.
- Lucas, H.C., Jr., Ginzberg, M.J., and Schultz, R.L. *Information Systems Implementation: Testing A Structural Model* Ablex Publishing Corporation, Norwood, New Jersey, 1990.
- Magal, S.R., Carr, H.H., and Waston, H.J. "Critical Success Factors for Information Center Managers," *MIS Quarterly* (12:3), 1988, pp 413-425.

- Miles, M. B. & Huberman, A. M. (1994) *Qualitative Data Analysis: An Expanded Sourcebook*, Thousand Oaks, California, SAGE Publications Inc.
- Nord, W.R., and Tucker, S. *Implementing Routine and Radical Innovation* Lexington Books, Lexington, M.A., 1987.
- Orlikowski, W.J. "The Duality of Technology: Rethinking the Concept of Technology in Organizations," *Organization Science* (3:3), 1992, pp 398-427.
- Orlikowski, W.J., and Robey, D. "Information Technology and the Structuring of Organizations," *Information Systems Research* (2:2), 1991, pp 143-169.
- Orlikowski, W. J. (1996) Improvising Organizational Transformation Over time: A Situated Perspective. *Information Systems Research*, 7, 63-92.
- Pettigrow, A.M. "Context and Action in the Transformation of the Firm," *Journal of Management Studies* (24:6), 1987, pp 649-670.
- Pierce, J.L., and Delbecq, A. "Organization Structure, Individual Attributes and Innovation," *Academy of Management Review* (2:1), 1977, pp 27-37.
- Purvis, R.L., Sambamurthy, V., and Zmud, R.W. "The Assimilation of Knowledge Platforms in Organizations: An Empirical Investigation," *Organization Science* (12:2), 2001, pp 117-135.
- Ranson, S., Hinings, G., and Greenwood, R. "The Structure of Organizational Structures," *Administrative Science Quarterly* (25:1), 1980, pp 1-17.
- Riley, P. "A Structurationist Account of Political Culture," *Administrative Science Quarterly* (28:3), 1983, pp 414-437.
- Rogers, E.M., and Shoemaker, E.F. *Communications of Innovations* Free Press, New York, NY, 1971.
- Sharma, R., and Yetton, P. "The Contingent Effects of Management Support and Task Independence on Successful Information Systems Implementation," *MIS Quarterly* (27:4), 2003, pp 533-555.
- Soh, C., and Sia, S.K. "An Institutional Perspective on Sources of ERP Package-organization Misalignments," *Journal of Strategic Information Systems* (13:4), 2004, pp 375-397.
- Sultan, F., and Chan, L. "The Adoption of New Technology: The Case of Object-oriented Computing in Software Companies," *IEEE Transaction on Engineering Management* (47:1), 2000, pp 106 -126.
- Swanson, E.B. "Information systems innovation among organizations," *Management Science* (40:9), 1994, pp 1069-1092.
- Waston, H.J., Goodhue, D.L., and Wixom, B. "The Benefits of Data Warehousing: Why Some Organizations Realize Exceptional Payoffs," *Information & Management* (39:6), 2002, pp 491-502.
- Watson, H.J., Ariyachandra, T., and Matyska, R. "Data Warehousing Stages of Growth," *Information Systems Management* (18:3), 2001, pp 42-50.

Appendix A - The Benchmark Variable Matrix for the Stages of Growth in Data warehousing
Adopted from (Watson et al. 2001)

Benchmark variables	Initiation stage	Growth stage	Maturity stage
Data	Limited amount for a single or few subject areas	Data for multiple subject areas	Enterprise wide data, well integrated and for multiple time periods
Architecture	A single data mart	Multiple data marts	A data warehouse with dependent data marts
Stability of the production environment	Procedures are ad hoc and evolving	Procedures are not well established	Procedures are routinized and documented
Warehouse staff	In-house personnel inexperienced; consultants are frequently used	In-house personnel have gained experience and consultants are not heavily relied on	In-house personnel are experienced; the staff has well-defined roles and responsibilities
Users	Analysts in the business unit served by the data mart	Users from all of the business units are served by the data marts, diverse in their information needs and computer skills	Users from throughout the organization access the warehouse; suppliers and customers may have access to the warehouse data
Impact of users' skills and jobs	Some users may not have the skills or inclination for the more analytical jobs	More users experience changes in the skills they need in order to perform their jobs	Users throughout the organization need improved computer skills in order to perform their jobs
Applications	Reports are predefined and ad hoc queries, backward looking to what has already occurred	Reports and predefined queries, more analysis of why things occurred and "what-if" analyses for future scenarios	Reports, redefined queries and ad hoc queries, DSS and EIS; data mining provides predictive modeling capabilities; integration with operational systems
Costs and benefits	Costs are moderate; benefits include time savings new and improved information and improved decision making	Benefits include time savings, new and better information and improved decision making, the benefits exceed the costs for the first time	Benefits include time saving, new and better information, improved decision making, redesigned business processes and support for corporate objectives; high ROI may be realized
Organizational impact	Operational and tactical in a few business units	Operational and tactical in additional business units	Organization wide and often strategic as well as operation and tactical